

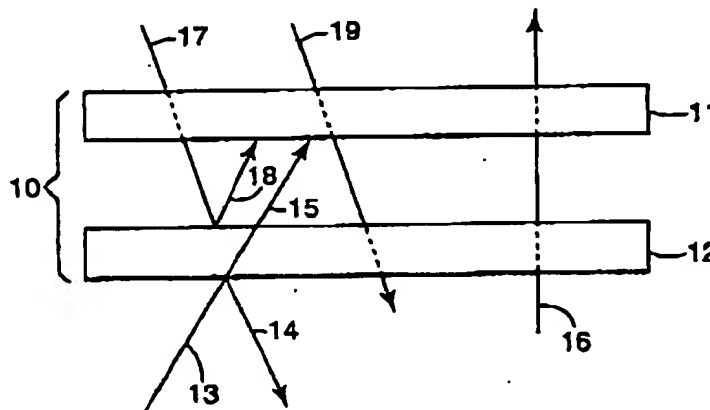
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(54) Title: OPTICAL POLARIZER



(57) Abstract

A reflective polarizer and a dichroic polarizer are combined to provide an improved optical polarizer. The dichroic and reflective polarizers are typically in close proximity to each other, and are preferably bonded together to eliminate the air gap between the polarizers. The combination of the two polarizers provides a high reflectivity of one polarization and high transmission for the perpendicular polarization from the reflective polarizer side of the combined polarizer, and high absorption and transmission for light of orthogonal polarization from the dichroic polarizer side. The combination also reduces iridescence as seen in transmission and when viewed in reflection from the dichroic polarizer side. The increased extinction ratio and low reflectivity of the optical polarizer allows use of a lower extinction ratio dichroic polarizer in applications requiring a given extinction ratio and high transmission.

WHAT IS CLAIMED IS:

1. An optical polarizer, comprising:
a reflective polarizer which transmits light having a first polarization and
5 reflects light which does not have the first polarization; and
a dichroic polarizer positioned in the same optical path as the reflective
polarizer.
2. The optical polarizer of claim 1 wherein the reflective polarizer has a first
10 transmission axis and wherein the dichroic polarizer has a second transmission
axis, and further wherein the first transmission axis is aligned with the second
transmission axis.
3. The optical polarizer of claim 1 wherein the dichroic polarizer is
15 positioned to provide antireflection on at least one side of the reflective polarizer.
4. The optical polarizer of claim 1 wherein the reflective polarizer comprises
a multilayer stack of at least two materials, at least one of which is birefringent.
- 20 5. The optical polarizer of claim 4 wherein the dichroic polarizer is
incorporated into at least one of the layers in the multilayer stack.
6. The optical polarizer of claim 4 wherein at least one of the materials is
polymeric.
- 25 7. The optical polarizer of claim 6 wherein the birefringent polymeric
material is PEN.

9. The optical polarizer of claim 8 wherein the two polymeric materials exhibit no refractive index difference for light of the first polarization, and further which exhibit a refractive index difference for light that does not have the first polarization.
- 5
10. The optical polarizer of claim 9 wherein the multilayer stack comprises alternating layers of PEN and coPEN.
11. The optical polarizer of claim 1 wherein the dichroic polarizer is bonded
10 to the reflective polarizer.
12. An optical polarizer, comprising:
a reflective polarizer which transmits light of a first polarization along a first transmission axis, and which reflects light of a different polarization; and
15 a dichroic polarizer having a second transmission axis substantially aligned with the first transmission axis.
13. The optical polarizer of claim 12 wherein the dichroic polarizer is positioned to provide antireflection on at least one side of the reflective polarizer.
- 20
14. The optical polarizer of claim 13 wherein the reflective polarizer is comprised of a multilayer stack that includes at least one birefringent material.
15. The optical polarizer of claim 14 wherein the dichroic polarizer is
25 incorporated into at least one of the layers in the multilayer stack.
16. A display device, comprising:

a dichroic polarizer in the optical path of the reflective polarizer;
wherein the reflective-dichroic polarizer is illuminated from at least one
outside facing surface.

- 5 17. The display device of claim 16 wherein the dichroic polarizer is aligned
to provide antireflection from a viewing side of the display device.
- 10 18. The display device of claim 16 wherein the reflective polarizer has a first
transmission axis and wherein the dichroic polarizer has a second transmission
axis, and further wherein the first transmission axis is aligned with the second
transmission axis.